

Decision No. 53675**ORIGINAL**

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Investigation upon the Commission's  
 own motion into the reasonableness and  
 propriety of rates, rules, regulations,  
 contracts and practices of electrical  
 corporations in connection with  
 electric service furnished for use in  
 the operation of electric welding  
 machines and equipment.

Case No. 4963

(A list of appearances and witnesses is  
 included herein as Appendix C.)

OPINION ON FURTHER HEARING

The above-entitled investigation was instituted by the Commission on July 27, 1948. After two days of public hearing thereon, the Commission on March 15, 1949 issued Decision No. 42601, finding that certain existing rules and regulations of electrical corporations governing service furnished to electric welders were unreasonable in some particulars. Revised rules and rates were authorized, but before the effective date thereof informal studies indicated in certain specific instances the possibility of inequitable charges resulting therefrom. Therefore, on May 3, 1949, this case was reopened for further hearing for the purpose of determining whether Decision No. 42601 should be rescinded, altered, or amended in any particular.

Further Public Hearing

After due notice, additional days of hearing were held on June 9, 1954, and January 4, 1955, in Los Angeles, and on October 19, 1954, in San Francisco before Examiner M. W. Edwards. A total of five days of hearing have been held on this investigation, the first

two being held on September 13 and 22, 1948. The matter finally was submitted for decision on January 4, 1955. An Examiner's Report was issued on December 29, 1955 and exceptions thereto received on January 18, 1956. In the Commission's opinion there is now sufficient information of record to warrant a revised decision in this matter.

Additional Staff Analysis

In response to a request by the staff, the utilities in the state surveyed and reported on the effect of applying the tariff provisions contained in Decision No. 42601 to a total of 1,351 welding installations. The staff's analysis of the data submitted by the various utilities revealed that the effect on customers' billing ranged, in specific instances, from a reduction of 23.5% to an increase of 3,733% and revealed the following difficulties:

1. Excessive increases in charges for service to some industrial customers on demand schedules, particularly those having many resistance welder units combined with other load.
2. An inequitable relation between charges on connected load schedules for transformer type arc welders as compared with motor generator arc welders of the same capacity.
3. Difficulties in determination of the ratings of welders as prescribed in the rule.

After studying the early record in this case and additional technical literature on electric welders the staff proposed a revised welder rule in Exhibit No. 10 designed for the purpose of overcoming the above-listed difficulties.

Briefly the staff's proposed rule prescribes a uniform method for rating welders and provides that welders will be billed in accordance with provisions of the tariffs on which they are served,

such tariffs to be modified, however, so that charges thereunder will reflect a reasonable compensation for the service rendered.

Motor Generator Arc Welders

The staff proposed that the horsepower rating of the motor driving a motor generator type arc welder be taken as the horsepower rating of the welder. This proposal appears reasonable because the motor and generator tend to iron out the sharp fluctuation in load when the arc is struck or broken and the load, in general, is no different than the load imposed by any motor which operates under variable loading conditions.

Transformer Arc Welders

The staff proposed that the nameplate maximum kva input (at rated output amperes) be taken as the rating of transformer type arc welders. These units are relatively small in size, ranging up to about 25 kva as a maximum. The arc is struck by means of an electrode and usually is on for an appreciable length of time. The analysis did not indicate that the loads of transformer arc welders were such as to cause the utility to provide added distribution system capacity very much greater than the input rating of the welders.

Resistance Welders

The staff proposed that resistance welder ratings be determined by multiplying the welder transformer nameplate rating (at 50% duty cycle) by factors which were developed primarily from an analysis of the electrical characteristics for standard types of resistance welders as published by the Resistance Welders Manufacturers

Association. These factors are listed below:

<u>Type of Welder</u>	<u>Transformer Name Plate kva Rating @ 50% Duty Cycle</u>	<u>Factor</u>
Rocker Arm, Press or Projection Spot	20 kva or less	.60
Rocker Arm or Press Spot	Over 20 kva	.80
Projection Spot	21 to 75 kva, incl.	
Flash or Butt	100 kva or over	
Seam or Portable Gun	All sizes	
Flash or Butt	67 to 100 kva, incl.	*
Projection Spot	Over 75 kva	1.20
Flash or Butt	66 kva or less	

\* Each flash or butt welder in this group will be rated at 80 kva.

Resistance welders present a more difficult problem than motor generator or transformer arc welders. Resistance welding is a process for joining two or more pieces of metal in which the weld is formed by applying pressure to the point to be welded, heating the metal to fusing temperature by passing an extremely high current (seldom less than 5,000 amperes, sometimes more than 100,000 amperes) through the pressure area, then maintaining pressure until the fused metals solidify. Usually the current is on for a short period and then off for a period. The rating is based on the duty cycle and for a low duty cycle the welding kva may be as much as 7 times the welder transformer kva rating. There is practically no limit to the size of a resistance welder and it may be as high as 2,000 kva or more. The intermittent nature and size of resistance welder load is such as to cause sudden decreases in line voltage which if repeated at short intervals will cause objectionable light flicker.

To supply energy to resistance welders with their special characteristics the utility may have to provide oversized facilities

specifically to serve the welder load. Such added facilities may range from additional transformer capacity to the complete isolation of a heavy distribution circuit for the sole use of a welder. The utility may be faced with a major project of reinforcing and rearranging its electric system. Not only is the utility concerned but likewise the customer must provide adequate wiring on his side of the utility's meter.

#### Billing Proposal

The staff proposes that, in all cases where connected load is a factor involved in rate calculations, welder load be included as part of the connected load with no allowance for diversity between welders. However, on all schedules in which metered demand is a factor in rate calculations, it proposes that the diversified resistance welder load be calculated by multiplying the individual resistance welder ratings by the following factors and adding the results thus obtained:

- 1.0 times the rating of the largest welder
- 0.8 times the rating of the next largest welder
- 0.6 times the rating of the next largest welder
- 0.4 times the rating of the next largest welder
- 0.2 times the rating of all additional welders

If the diversified resistance welder load computes out as greater than the metered demand, the staff proposes that the diversified resistance welder load be used in lieu of the metered demand.

#### Objections To Staff Proposal

Objections were made to the staff's proposal, primarily on the basis of the administrative difficulties which would be created by the necessity of making field load checks on all commercial and industrial accounts.

A witness for Pacific Gas and Electric Company testified that his company had approximately 238,000 commercial and industrial accounts of which about 44,000 were load checked on a bi-annual basis.

Application of the staff's proposal would require load checking of the remaining 194,000 accounts. He estimated that if such load checks were performed on a bi-annual basis it would cost the company an additional \$300,000 each year and that only about \$150,000 additional revenue would be obtained. Thus, the cost would exceed the additional revenue by about \$150,000 a year. The same witness also testified that it would be difficult to explain the staff-proposed rule to customers; that the required load checking would be a source of annoyance to the customers and further that the increases which would result in the bills of some customers would be considered grossly excessive by those customers.

Another witness for Pacific testified that he knew of no utility with a policy for billing welder service as extensive or as complicated as the staff's proposal in Exhibit No. 10<sup>1/2</sup>. Such testimony was based on an investigation of some 45 other large utilities, the results of which are set forth in Exhibit No. 15. His general observation was that those utilities operating in states other than Wisconsin and California have adopted rules which assess special or additional charges for welder service only in those cases where excess capacity or investment is installed over and above that required for normal operations and which are assumed to be covered by the general filed tariffs.

Somewhat similar objections were raised by a witness for the California Electric Power Company who testified that his company has tried to eliminate all load checks or surveys that might annoy customers or cause poor public relations. He stated that simplifying of rates and records has been the aim of his company in rate making

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<sup>1/</sup> Transcript Page 335, Lines 1-4

for the past twenty years. His general conclusion was that the probable revenue gain did not justify the added cost of enforcing the rule.

The California Manufacturers Association in general was opposed to the staff's proposed rule where welders are served in conjunction with other load. Its witness stated that the large number of complaints on interference with service to adjacent customers occurred during a period following World War II when electric distribution systems were heavily loaded considering the availability of copper and related materials of construction. He stated that the widespread problems of electric welder service interference which had been anticipated never materialized. He knew of no serious welder problems at the present time that the utilities have not been able to handle under existing rules and procedures. If the Commission still considers that some uniform welder rule is necessary, he favors adoption of a rule of the nature proposed by the Pacific Gas and Electric Company.

#### Pacific Gas and Electric Company Proposal

A witness for the Pacific Gas and Electric Company submitted, by Exhibit No. 6-A, a proposed electric welder rate entitled Schedule P-8, Welder Apparatus. Briefly, his proposal is that where service facilities must be installed other than the customary meter and service, to charge an additional 20 cents per kva of additional transformer capacity if the welder is served through the same meter as other load, or if the welder is separately served, a minimum charge of 65 cents per kva of the welder capacity or of the transformer capacity required to render the service, whichever is lower. Where other service facilities must be installed, such as a separate feeder, an additional charge will be made equal to 1½% per month of the cost of such special facilities. His proposal would also apply

to apparatus other than welders if such apparatus were subject to violent voltage fluctuations.

Discussion

The Southern California Edison Company was in accord with the staff's thought that a filed tariff provision covering service to and billing of electric welders is desirable and it believes such tariffs should be so constructed as to obtain maximum simplicity in their application and minimum administrative effort, and should produce adequate compensation through the application of the individual electric company tariffs. Edison's counsel thought that the staff's latest suggestion, Exhibit No. 10, meets the general requirements better than any rule yet proposed, and he would not object to its being prescribed by the Commission if, after experience, the Commission would entertain proposals for such revisions as might appear to be desirable.

It is apparent, however, that there are more parties opposed to the staff's welder rule than are in favor of it. The principal objection comes from the utilities which have simplified their general service schedules to the point where only a relatively small service charge is assessed and the minimum charge on single-phase power load has been eliminated. For example, Pacific Gas and Electric Company's General Service Schedules Nos. A-1, A-2, A-3, A-4, A-5, A-6, A-10, A-11 and A-12 are of this type and only require minimum charges for polyphase motor loads. On this type of schedule it is apparent that a large, low load factor, single phase resistance welder load probably would not be compensatory.

One of Pacific's witnesses testified that he had recommended to the Company's rate department several years ago that consideration be given to including single-phase welders as well as certain other rectifier and industrial three-phase heating loads under the minimum



charge provisions of the connected load schedules. He testified further, however, that from a practical standpoint the inclusion of such load for minimum charge purposes should be made only in those cases where interference was being created or where other three-phase load was involved. While Pacific objects to the staff proposal, it nevertheless sees the need for some added revenues from certain installations. It has heretofore solved this problem by making service contracts with customers that require such facilities. The Commission is desirous of eliminating special rate contracts and desires that all load be served on regularly filed tariffs.

Whereas on the surface it appears that the staff's and Pacific's proposals are at opposite extremes, analysis shows that both proposals recognize that in many cases the revenues obtained from serving resistance welder installations is not compensatory unless special minimum charges or service charges are assessed for the welder load. Pacific's proposal is based on the theory that such service or minimum charges should be made only when special facilities other than the customary meter and service are required. The record is not clear however as to what constitutes the special facilities. Certainly any load served requires transformer capacity as well as some system capacity all the way back to generation. Because of the high diversity of resistance welder load, the problem under Pacific's proposal in most cases is primarily confined to a determination of what portion of the step-down transformer capacity is required for the welder service. This requires judgment on the part of the company personnel in allocating the capacity and consequently the charge paid by the welder customer depends upon such judgment allocation. Furthermore, for existing installations it appears that discrimination in application of charges would result, as the company would make no effort to locate welders through load surveys but would apply the rate only in those cases where interference to service to

other customers has resulted. Because of these circumstances charges for welder service under Pacific's proposal would vary throughout a utility system depending upon whether or not adequate capacity to serve the welder load is already available at a particular location and also as to the allocations which may be made of installed transformer capacity.

The staff's proposal on the other hand is based on the premise that the charges for welder service should reflect average service conditions to welders and should not be dependent on the incremental costs of certain additional facilities which may or may not have to be installed by the utility to serve the welders.

The staff proposed to use a computed diversified resistance welder load for billing purposes on a metered demand schedule if such computed load exceeds the metered demand. Such procedure would be unnecessary if the interval on the demand meter were short enough to register the full welding demand. However, the capacity of the system facilities which the utility installs normally is based on a longer time interval, such as one-half to one hour. Rates in general have been predicated upon demand time intervals of 15 to 30 minutes. A customer in selecting a demand schedule receives sufficient credit for diversity in his regular load but receives far too much credit for diversity of his resistance welder load which does not register adequately on the demand meter.

#### Exceptions to Examiner's First Report

Many of the exceptions filed to the Examiner's Report were a continuation of the objections lodged during the hearing, some of which already have been stated and discussed. The three matters deserving further discussion are (1) the necessity of the utilities to extensively survey all classes of customers to locate resistance welder load (2) the question of reduced rating factors where the

customer owns the distribution transformer and (3) substitution of a special minimum charge for a computed demand charge.

In order that existing customers will be charged on the same equitable basis as new customers adequate surveys must be made to locate and rate the welder loads. However, the cost of surveying may be minimized by restricting the survey to only those customers likely to have welder load. In this connection the utilities would not be expected to field survey mercantile establishments handling such items as clothing, groceries, liquors, shoes, hardware and produce; service establishments such as bars, restaurants, warehouses, barber shops, beauty salons, shoe repair stores, and doctors', dentists' and attorneys' offices; homes, apartment and guest houses, hotels and other establishments where welders are not ordinarily used.

The staff's proposal did not provide an allowance where the customer owns the distribution transformer. The provision in the Examiner's Report for reduced rating factors in these instances reflects the cost saving to the utility but was objected to on the basis that such savings are already reflected by voltage discount provisions of the present tariffs. Voltage discounts are usually in the range of 2 to 5 per cent of the total bill and are predicated upon average service and load factor conditions. Such voltage discounts are not adequate where the major portion of the load consists of resistance welders operated at low load factors.

Objections to replacing the computed demand charge by a special minimum charge were made on the basis that such a change had not been considered in the testimony. In effect the calculated demand results in imposing a realistic minimum charge where energy consumption is low and, since the calculated demand basis for billing is supported by the testimony, it will be adopted.

While much concern has been expressed regarding the complicated nature of the staff's proposed rule and that the cost of

administration will be more than the gain in revenue, only one example need be cited to show the need for it. In Exhibit No. 11 the Pacific Gas and Electric Company lists one customer with a 30 kw rocker arm spot welder for which the utility states that 20 kva of additional transformer capacity are required at an installation cost to it of \$200.00. The annual bill was \$9.04 to this customer. This amount does not even pay interest on the special investment, not to mention the cost of providing the service, metering, depreciation and all of the other utility service costs. We do not need a detailed cost analysis to determine that this customer is a burden on the utility's other customers. Obviously, their rates have to be higher to make up for his deficiency. The staff's proposal would raise this customer's bill to \$174.40 per year.

In addition to the exceptions enumerated above there were specific exceptions relating principally to points of clarity which will be incorporated in the order herein.

#### Conclusion

After considering the record and the points and objections raised by various parties, it is concluded that the unusual nature of the electric service required by welding equipment should be recognized; that a uniform rule for the rating and billing of welders should be adopted by the Commission; and that rate schedules should be revised to conform thereto.

The staff's proposal, if revised to provide proper allowance for customer ownership of transformers, appears to provide a reasonable solution to this problem. Under such a revised proposal charges for welder service will be uniform in a particular utility service area, and will not be dependent upon existing capacity of the utility serving facilities at that location nor upon a judgment

assignment of capacity. Although a certain amount of additional load checking will be required, the Commission is of the opinion that adequate checks should be made of connected load to insure that charges are being applied in a nondiscriminatory manner and to enable the utility to determine that any changes or additions to its load since the last check have been accounted for, that the load is within the capacity of the utility's facilities to handle the service, and that the proper rate schedules are being applied. Once the welders are located the future costs of checking and maintaining records should not be nearly as costly as indicated by certain respondents. Welder load of new customers will be accounted for at the time their service is established, and additional welder load of existing customers will generally be accounted for under existing rules and regulations which require the customer to notify the utility of any material change in his connected load.

In view of the fact that some existing welder customers may have their bills considerably increased, it is only proper that they be given proper notice and allowed sufficient time to readjust their equipment or rearrange their circuits so that the increases may be avoided or held to a minimum level. For new welder load, or for those existing welder customers who change locations, these new rules will be applied shortly after the effective date of this order, but for the other existing customers a minimum notice of six months will be required before the new rules may be applied. The utilities will be required to survey expeditiously existing welder load and have such surveys completed and notification given to existing customers by August 30, 1957 with the new rules to be effective for such customers on and after March 1, 1958.

The Commission finds that the existing rates, rules and regulations of electrical corporations under the jurisdiction of this Commission are, for the future, unjust and unreasonable to the extent that they provide for the correction of power factor of electric welders or provide for the rating of electric welders on a basis which differs from that ordered herein, or require that welders of more than 2 kw shall be served through separate services; and that such increases in rates and charges as may result in the future from the making effective of the revisions of tariff schedule rates, rules and conditions, and revisions of contracts and practices of electric corporations as ordered or authorized herein are hereby found to be justified and that said rates and charges are reasonable.

O R D E R

An original and supplemental investigation into the reasonableness and propriety of rates, rules, regulations, contracts and practices of electrical corporations in connection with electric service furnished for use in and operation of electric welding machines and equipment having been conducted on the Commission's own motion, hearings having been held, the matter having been submitted and the Commission being of the opinion that a revised welder rule should be prescribed but that existing customers should be given proper notice and at least 6 months time in which to adjust or revise their welder load; therefore

IT IS HEREBY ORDERED that within thirty days after the effective date of this order, each of those electrical corporations within the jurisdiction of this Commission:

1. Shall file in quadruplicate with this Commission, in conformity with General Order No. 96, to become effective on five days' notice:

- a. Such revisions of its tariff schedules as may be necessary to remove therefrom all requirements for the correction of power factor of electric welders, provisions for the rating of electric welders on a basis which differs from that ordered herein, and all existing requirements that welders of more than 2 kw shall be served through separate services.
- b. As a part of its Rule and Regulation No. 2, provisions substantially in accordance with those shown in Appendix A, attached hereto and made a part hereof.
- c. Revisions of its rate schedules where applicable, substantially in accordance with those shown in Appendix B, attached hereto and made a part hereof.

2. May file in quadruplicate with this Commission, in conformity with General Order No. 96, to become effective on five days' notice concurrent with the filing required by Section 1 above:

- a. Such revisions of its tariff schedules as will provide for the application of its general power and/or general service tariffs to welders which are metered separately from other load.
- b. Such revisions of its tariff schedules as will limit the welder load to 2.9 kva or less at 230 volts and to 0.5 kva or less at 115 volts on those schedules like domestic service, lighting service or special service, on which only small amounts of power load may be combined with lighting.

3. Shall apply such revised tariff schedules to all new welder loads, or to those existing welder load customers who change locations, on and after the effective date of the revised tariffs.

4. Shall survey existing welder load and notify existing customers of the effects of the revised tariffs on or before August 30, 1957 and shall apply the revised tariffs to such customers on and after March 1, 1958.

5. Shall report to the Commission, on or before August 30, 1957, what disposition it proposes to make with respect to each and every special contract that it may have entered into with existing customers for service to electric welders.

IT IS HEREBY FURTHER ORDERED that Decision No. 42601 be and the same is hereby set aside and vacated and that the herein decision supersede the same.

The effective date of this order shall be twenty days after the date hereof.

Dated at Los Angeles, California, this 29th day of August, 1956.

[Signature]  
President  
[Signature]  
[Signature]  
[Signature]  
[Signature]  
Commissioners



APPENDIX ARule and Regulation No. 2  
Page 1 of 2( ) Welder Service1. Rating of Welders

Electric welders will be rated for billing purposes as follows:

a. Motor Generator Arc Welders

The horsepower rating of the motor driving a motor generator type arc welder will be taken as the horsepower rating of the welder.

b. Transformer Arc Welders

Nameplate maximum kva input (at rated output amperes) will be taken as the rating of transformer type arc welders.

c. Resistance Welders

Resistance welder ratings will be determined by multiplying the welder transformer nameplate rating (at 50% duty cycle) by the appropriate factor listed below:

<u>Type of Welder</u>	<u>Transformer Nameplate Rating @ 50% Duty Cycle</u>	<u>Factor</u>	
		<u>Utility Owned Distrib. Transf.</u>	<u>Customer Owned Distrib. Transf.</u>
Rocker Arm, Press or Projection Spot	20 kva or less	.60	.50
Rocker Arm or Press Spot	Over 20 kva	.80	.60
Projection Spot	21 to 75 kva, incl.)		
Flash or Butt	100 kva or over		
Seam or Portable Gun	All sizes		
Flash or Butt	67 to 100 kva, incl.	*	*
Projection Spot	Over 75 kva	1.20	.90
Flash or Butt	66 kva or less		

\* Each flash or butt welder in this group will be rated at 80 kva where distribution transformer is owned by the utility or 60 kva where distribution transformer is owned by the customer.

APPENDIX A

Rule and Regulation No. 2  
Page 2 of 2

- d. Ratings prescribed by a, b, and c above, normally will be determined from nameplate data or from data supplied by the manufacturer. If such data are not available or are believed by either the utility or customer to be unreliable the rating will be determined by test.
- e. If established by seals approved by the company, the welder rating may be limited by the sealing of taps which provide capacity greater than the selected tap and/or by the interlocking lockout of one or more welders with other welders.
- f. When conversion of units is required for tariff application, 1 welder kva will be taken as 1 horsepower for tariffs stated on a horsepower basis and 1 welder kva will be taken as 1 kilowatt for tariffs stated on a kilowatt basis.

2. Billing of Welders

Welders will be billed at the regular rates and conditions of the tariffs on which they are served, subject to the following provisions:

a. Connected Load Type of Schedule:

Welder load will be included as part of the connected load with ratings as determined under Section 1, above, based on maximum load that can be connected at any one time, and no allowance will be made for diversity between welders.

b. Demand Metered Type of Schedule:

Where resistance welders are served on these schedules the computation of diversified resistance welder load shall be made as follows:

Multiply the individual resistance welder ratings, as prescribed in Sections 1-c to 1-f inclusive, above, by the following factors and adding the results thus obtained:

- 1.0 times the rating of the largest welder
- 0.8 times the rating of the next largest welder
- 0.6 times the rating of the next largest welder
- 0.4 times the rating of the next largest welder
- 0.2 times the ratings of all additional welders

If this computed diversified resistance welder load is greater than the metered demand, the diversified resistance welder load will be used in lieu of the metered demand for rate computation purposes.

APPENDIX B

Revision of Rate Schedules  
Page 1

Connected Load Types of Schedules on which Power Load may be Served

Revise wording of minimum charge provision, where necessary, so as to make regular minimum charge of schedule applicable for all welders.

Example:

Minimum Charge

65¢ per month per horsepower of welder load  
and per horsepower of polyphase connected  
motor load.

Demand Metered Type of Schedule

Revise wording of special conditions so as to establish the computed diversified resistance welder load as a minimum metered demand.

Example:

Maximum Demand

The maximum demand shall be the kilowatts  
of measured maximum demand but not less  
than the diversified resistance welder  
load computed in accordance with Rule and  
Regulation No. 2\_\_.

APPENDIX C

LIST OF APPEARANCES

Respondents: Southern California Edison Company by Bruce Renwick and Rollin E. Woodbury; Pacific Gas and Electric Company by R. W. DuVal, Rudolph Jenny, F. T. Searls and J. C. Morrissey; California Electric Power Company by G. C. Delvaille; San Diego Gas and Electric Company by H. G. Dillin, R. J. Phillips, F. R. Porath and S. R. Duhring of Chickering and Gregory; Coast Counties Gas and Electric Company by J. K. Horton, G. E. Bishop and Charles Grunsky;

Interested Parties: California Manufacturers Association by George Kinsman and Homer R. Ross; California Farm Bureau Federation by J. J. Deuel and Eldon Dye; Twelfth Naval District by Oliver O. Rands; Sacramento Municipal Utility District by Albert Hamilton; Department of Water & Power, City of Los Angeles by John E. Girard; Pasadena Light & Power Department by F. V. Frey; Lincoln Electric Company by John B. McCormick.

Commission Staff: Lewis R. Knerr and John J. Doran.

LIST OF WITNESSES

Evidence was presented on behalf of the respondents by:

C. L. Ashley, H. G. Dillin, Rudolph Jenny,  
James F. Pollard, Thomas A. Betterworth,  
R. W. Joyce and G. C. Delvaille.

Evidence was presented on behalf of the Commission staff by:

Richard T. Perry and Leonard S. Patterson.